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TITLE: COVERING ARRANGEMENT FOR SWIMMING POOLS

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ABSTRACT:

A covering arrangement for swimming pools or similar open areas in which a flexible cover has one end attached to a drum, and which may be wound onto the drum or rolled off from the drum. A reversible motor operates the drum for unwinding the cover when the motor operates in one direction of rotation. In the reverse direction of the motor, the cover is rolled off from the drum. A carriage serves to carry the drum which is provided with transport mechanisms on each side. A coupling arrangement connects the motor to the transport mechanisms when the motor rotates the drum for the purpose of unwinding the cover from the drum. When, on the other hand, the cover is to be wound onto the drum, the motor is connected by the coupling arrangement to the drum.

21 Claims, 8 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 5

BRIEF SUMMARY:

(1) BACKGROUND OF THE INVENTION

(2) The invention concerns a covering arrangement for free areas, particularly swimming basins and pools, with a flexible cover attached at one end to a drum, and capable of being rolled up on and off the drum which is operated by a motor.

(3) Covering installations of this type are applicable to the covering of many different types of free areas, for example: green houses, roovers, tennis courts, atria, flower beds, etc. The installations are particularly important for covering swimming pools or basins. Here the cover can rest on the water surface, and can be floatable, or it can be led along the edges of the basin. The cover can be formed from layers, or it can be rigid in the transverse direction and thereby be able to support at least children.

(4) The main purposes of such covers in protection against pollution, temperature and humidity differences, particularly loss of heat. Thus, good heat-insulating materials are sometimes used.

(5) Generally, the drum is in a fixed location at one end of the area to be covered, while the cover, which can be formed by rigid elements to constitute a roll-blind type of structure, is pulled out by hand, and pulled in by a spring. Motor drives are also known for this purpose.

(6) In an installation for covering tennis courts or similar areas, the drum has been provided with a hand crank and installed on a cart that can also be moved by hand. But here, the operation is particularly cumbersome and laborious.

(7) Furthermore, there are covers made of zig-zag configurations of foldable plates, pulled out by a carriage driven by an electric motor. The covers are

pulled out of either a fixed housing or a housing on the carriage. But such installations are expensive and subject to frequent failure.

(8) Accordingly, it is an object of the present invention to provide a covering arrangement for any desired free areas, particularly swimming basins or pools, which is as simple and inexpensive as possible, is easily operated without the use of manpower, and can be applied to installations already in existence.

(9) SUMMARY OF THE INVENTION

(10) The objects of the present invention are achieved by providing a covering installation with a flexible cover which is attached at one end to a drum, and is capable of being rolled onto and off the drum which is operated by a motor. The drum is installed on a carriage that is transportable in a conventional manner by a reversible transport motor and two lateral transport mechanisms. The transport motor can be coupled in its one direction of rotation to the transport mechanisms for pulling out or unwinding the cover. The transport motor can be coupled in its other direction to the drum for rolling up the cover.

(11) Here the cover itself is not in motion relative to the area to be covered, the cover is simply unrolled over the area, anad is taken up when being rolled up again. While rolling up the cover, the carriage pulls itself along the cover until it reaches the initial position. Thus, a lateral orientation is achieved that makes additional elements, such as rails and guide rollers, superfluous. The only control prevails over the reversal of the direction of rotation of the transport motor and this can be carried out either directly at the carriage or at any other point that can be electrically connected. This, then, permits better supervision of the covering and rolling up processes. The technical equipment and the weight of the carriage are so small, that very little driving power is required, and that, if necessary, the carriage can be halted by hand. The cover is kept taut while being rolled up, and it is also kept under tension while being pulled out and in intermediate positions by frictional forces. Here tautening can also be obtained by using braking elements that are direction-dependent and act on the drum and the transport mechanism.

(12) According to one embodiment, two free-running couplings are connected to a common drive pulling element. Preferably, the coupling housings serve as the direction-changing wheels for the pulling element, which can be in the form of a belt, chain, or similar.

(13) In another embodiment, the transport motor, constructed as a gear motor, is placed inside the drum, and the motor housing is rigidly connected to the drum, while its drive shaft is coupled with a part of the frame of the transport mechanism in a manner enabling transmitting a torque. The drum is coupled to each of the front wheels of the transport mechanism by a free-running coupling. Here, the drum can form the only connecting element between the two lateral transport mechanisms. The transport motor is entirely enclosed in the drum, and is not seen from the outside. Since the motor housing is rigidly connected to the drum, the latter can serve as the cable drum for the energy-supplying cable. The cable needs no control wires since the control is carried out from a fixed location. Here, furthermore, no current path goes through a rotating contact, as is required for a separate cable drum. The number of separate parts is thus greatly reduced, correspondingly lowering the cost of the covering installation and the weight of the carriage. Therefore, very low drive power is required. Generally, a motor designed for automobile window wipers will suffice.

(14) Preferably, the support of the drive shaft on the frame of the transport mechanism is constructed as a brake in the manner of a slip clutch. Thus, when hitting a stop, the shaft, which is normally held, can turn without causing mechanical damage. Hence, automatically-operating limit stops are not absolutely essential. Preferably, the front wheel, too, is supported on the frame of the transport mechanism by a brake operating at least during the roll-up procedure.

(15) The front wheel, if possible, should have a greater outer diameter than the drum with rolled-up cover. An elastic substance should be provided for the equalization of the differences in speed between front wheel and drum. This insures that the carriage, in the pulling-out procedure, is always driven at a speed that is slightly higher than the unrolling speed of the cover. Thus, the latter is also pulled taut during this procedure without addtional effort, keeping the carriage always correctly oriented laterally.

(16) A slip clutch can serve as a means of equalization connected in tandem with the free-running coupling between front wheel and drum. At the same time, it is even simpler to form that equalizing element from a tire of soft, elastic, deformable material such as rubber, placed at the circumference of the front wheel. Here, just as with the slip clutch, there is the possibility that the tire, on reaching the limits of its holding forces on the surface, slips a little, thereby reducing the tension. With sufficient thickness of the tire, however, such slipping does not take place, since the equalizing deformation is limited to the portions of the circumference operative at the moment. During unrolling, always new sections of the circumference are deformed and then released. This is particularly pronounced when the tire has evenly distributed, radially protruding extrusions such as teeth or transverse ribs that are not supported in the circumferential direction against each other.

(17) The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

DRAWING DESCRIPTION:

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a sectional view through a rectangular swimming pool with a covering installation according to the present invention;

FIG. 2 is a plan view of the swimming pool with the covering installation of FIG. 1;

FIG. 3 is a partial sectional view taken along line III--III In FIG. 1, through a drum end with transport mechanism;

FIG. 4 is a plan veiw of a drum end of an altered covering installation with a conical cable drum part;

FIG. 5 is an embodiment according to FIG. 4; with a flat cable band;

FIG. 6 is a plan view of a transport mechanism with a caterpillar-like drive belt;

FIG. 7 is a bottom view of the caterpillar arrangement of FIG. 6; and

FIG. 8 is a side view of another embodiment of a cover carriage, according to the present invention.

DETAILED DESCRIPTION:

(1) DESCRIPTION OF THE PREFERRED EMBODIMENTS

(2) Referring to the drawing and in particular to FIGS. 1 and 2, a rectangular-shaped swimming pool has frontal walls 1, 2 and side wall 3, 4. A cover 30 is secured to a substantially horizontal plane surface 5 by means of bolts 32 or the like through its end 31, in the region of the frontal wall 1. The supporting surface 5 surrounds the swimming pool. The other end of the cover 30 is wound on a cylindrical drum 27 which connects two transport mechanisms 43, 44 to a common transport wagon 45. Each of the two transport mechanisms has a transport frame 46, a front wheel 47, and two rear wheels 48.

(3) In accordance with FIG. 3 at least one end of the drum is linked to a driving motor which serves as a transport motor 49. This motor is preferably in the form of a conventional disc-wiping type of DC motor which may be operated from a 12 volt voltage supply. A bearing member 52 is arranged on the driving shaft 51 of the transport motor, which is located centrally with respect to the drum axis 50. The bearing member 52 carries a first braked disc 53 which contacts the transport mechanism frame 46, through a second braked disc 54. A threaded portion 56 of the bearing member is passed through a bore of the frame 55, and is surrounded by a helical spring 57 which is positioned between the frame portion 55 and two nuts 58. The spring, the two nuts and the two wheels 48 ae covered from the exterior by a hood 59, which is placed over the frame portion 55.

(4) The drum 27 has an end cap 60 which is fixed to a ball bearing 61, so that the drum is held on the bearing member 52, through the ball bearing 61. The end cap 60 is in a torque transmitting manner connected with the first coupling disc 62 which forms a free-running coupling with a further coupling disc 63. The two coupling discs have elastically bendable projections on their frontal surfaces. These projections are in the form of short fiber portions which are inclined with respect to the plane of the disc in the circumferential direction, so that they reach into each other in a first direction of rotation whereby they transmit a torque. In the opposite direction of rotation, howwever, these projections lie against their discs and thereby provide a free-running effect. The drum 27 is held on the bearing member 52 by way of the aforementioned ball bearing 61 and the hub of the wheel 64.

(5) The second coupling disc 63 is in a torque transmitting manner connected with the wheel plate member 64 of the front wheel 47. A front driving rim 65 is drawn onto this wheel plate 64. The circumferential portion of the rim 65 is subdivided through transverse notches into transverse ribs 66 which project freely towards the exterior. The exterior diameter of the front wheel 47 is substantially larger than the diamter of the drum 27 when the cover is fully wound onto the drum.

(6) The wheel plate 64 has a hub portion 67 bent upwards, as shown in FIG. 3, which lies between the bearing member 52 and the ball bearing 61. In an alternate embodiment, this bearing arrangement can, for example, be in the form of a ball or roller bearing also on the bearing member 52, or outside of the ball bearing 61 on the end cap 60.

(7) Two further coupling discs 68, 69 are arranged between the wheel plate 64 and the brake disc 53. These further coupling discs 68, 69 are associated with a second free-running coupling which is engaged in the opposite rotational driection corresponding to the engagement of the coupling disc 62, 63, when the

cover is wound on. The coefficient of friction between the coupling disc 69 and the brake disc 53, is essentially smaller than that prevailing between the brake discs 53, 54. A substantially smaller brake torque is thereby obtained on the front wheel 47 than on the motor drive shaft 51. This smaller braking torque occurs only when winding up the cover, so that the transport mechanisms become braked only thereby and maintain the cover in stretched condition.

(8) The free-running coupling 62, 63 can also be located between the drum 27 and the front wheel 47, with one or two discs forming, for example, a slip clutch. The entire combination of brake and coupling discs are, in all cases, only of substantially small thickness.

(9) This thickness of this combination or package of brake and coupling discs are harmonized to the length of the bearing member 52, so that the shoulder surface 70 from which the threaded portion 56 extends, never comes into contact with the frame portion 55. Since the bearing member 52 abuts against the frame portion 55 axially through the motor 49 on the drum and through the nuts 58 and spring 57, the tension of the spring 57 between the frame portion and the end cap 60 is transmitted entirely onto the disc package therebetween. The entire transport mechanism can be also removed from the drum with the coupling and braking means, after removal of the hood 59 and loosening the nuts 58.

(10) The bearing member 52 can be connected in axial direction with the driving shaft 51, as might be assumed from above. This can be achieved through a threaded rod or similar means, which is drawn through an opening in the durm and in certain cases, through the end cap 60. It is, however, preferable to carry out this connection with the drive shaft by a mounted coupling which is insensitive to the direction of axle motion. This coupling then permits only small or no forcable torques to be transmitted to the shaft. The bearing member can then abut against the inner ring 71 of the ball bearing 61, through a shoulder surface. The end cap 60 then forms a closed assembly with the transmit mechanism, and this assembly can be mounted by itself onto the cylindrical end of the drum, whereby the bearing member comes into contact with the driving shaft 51. At the same time the end cap becomes coupled to the drum through, for example, two bolts.

(11) Since here the axial supporting force is not transmitted through the transport motor, the unit is able to function, due to the driving procedurre, when there is no transport motor at the particular drum end. Thus, it is possible to insert a transport motor at both ends or only at one, as required. Should the transport resistances prove too great for a transport motor, for example because of a change in span or in the transport speed, it is only necessary to install a second transport motor at the other drum end. However, the torque from one or two motors can be taken off in an evenly distributed manner at both ends of the drum 27, due to the great torsional stiffness of the drum

(12) Both transport motors can also be connected in parallel and to common, permanently attached current connectors in the drum. It is also possible, in a manner to be explained below to attach the end of a current-carrying cable to the drum, and to connect it directly to the motor connections. The cable also needs to contain only two current-carrying conductors for the two connections of the transport motors. A third grounding connection can of course be provided, but is generally not required because of the low potential of 12 volts employed. Control can always be achieved by a fixed control device, to which, again, the cables can be connected without rotary contacts.

(13) When the carriage 45 is to be transported from its position in FIGS. 1 and 2 to the right, rolled-up, end position, then the transport motor 49 is connected for a first direction of rotation, in which the motor housing with

the drum 27 rotates clockwise around driving shaft 51. The driving shaft 51 is held to part 55 of the frame by the bearing member and brake 53, 54 in a manner enabling torque transmission. Here, the free-running coupling 62, 63 is opened, i.e., the front wheel 47 is not driven but rolls off freely, while the free-running brake 68, 69 transmits a small braking torque through brake 53, 54. Thus, the carriage 45 is pulled to the right in FIGS. 1 and 2 only by the tension applied to cover 30. Since this tension is applied to the entire width of the cover, and the carriage is slightly braked, an exact lateral orientation results, becoming more exact as the carriage approaches the cover end 31 attached to the end of the basin. Additional centering devices are thus not required.

(14) When the cover is fully rolled up or the carriage 45 hits a stop, thereby holding in place drum 27, then the driving shaft 51 with bearing member 52 rotates against the resistance of the brake discs 53, 54 until the driving power is shut off. An automatic switch-off can be provided in a known manner.

(15) If the carriage 45 is now to be transported into the covering position, i.e., to the left in FIGS. 1 and 2, then there is a torque applied at first counterclockwise to drum 27. But the free-running coupling 62, 63, now closed, transmits the torque also to front wheel 47. This wheel, indpendently of the instantaneous roll diameter, always has a greater outer diameter than the drum with the cover, and rolls off directly onto the supporting area 5. Hence the wheel 47 attempts to move the carriage 45 with a greater speed than that corresponding to the instantaneous roll-off speed of the cover. This can be equalized as previously mentioned, by a slip clutch inserted between end cap 60 and the clutch disc 62, or by sometimes letting the front wheel slide slightly past supporting area 5. However, a practically complete equalization or compensation is already obtained because the individual parts of the circumference of tire 65 are deformed in the direction of the circumference, largely independently of each other, and then released. Thus, each transverse rib 66 arrives in a relaxed condition at the supporting area 5 and is deformed until released, without influencing the neighboring transverse ribs, by the difference between the drive distances of the wheel circumferences and the cover. If actually the difference between the distances is slightly larger than the deformation, then, in each case, one of the ribs slides slightly, without deteriorating the even rolling procedure. In this direction of rotation, too, the brake 53, 54 is activated when the cover is fully pulled out, or the transport movement is blocked by an obstruction.

(16) As shown in FIG. 4, one end of drum 27 is formed into a conical surface 74, bordered by two discs 73. A cylindrical cable 75 containing only two conductors 76, is wound onto the surface 74 in the manner of a spiral. The concial angle of the conical surface is so dimensioned that the winding diameter increases for each rotation by approximately the same amount as the increase obtained in rolling up the cover, so that the cable is always under the same tension as the cover.

(17) Another possibility is shown in FIG. 5. Here a flat cable ribbon 77 is provided that is either permanently fixed to the edge of cover 30, or is run through a tube 78 attached to the edge of the cover. The cable ribbon has approximately the same thickness as the cover, and is rolled up just as the latter, without any significant resulting change in diameter.

(18) In FIGS. 6 and 7, an endless caterpillar band 79, made of rubber or other appropriate material, has at least one outer, sub-divided gripping surface 80. This band is looped in circumferential grooves around front wheel 47' and two direction-changing wheels 48' in such a way that it rests throughout the distance between the two wheels 48' on supporting area 5. Here, too, a deformable tire can be provided around the circumference of front wheel

47, if there is no slip clutch included. But the loss here is small if some slip is allowed, as is common in belt drives. A further advantage of the caterpillar embodiment is the improvement in the directional stability of the transport drive.

(19) As is shown in FIG. 2, the cover can be narrower than the basin or pool, and can, therefore rest on the central portion of the swimming water. This is particularly advantageous on outside pools, since the cover then cannot be lifted by winds. Of course, the cover can also be wider than the pool or other area to be covered. This will generally be the case when green houses, sports arenas, or similar areas are to be covered. In this case, too, the carriage 45 according to the invention can find application without alteration.

(20) Furthermore, it is always possible to connect the lateral edges of the cover with stationary parts through additional means, as perhaps through zippers, which self-open and self-close during transport, or else through simple hooked connections. In this manner, rain or similar element can be prevented from driving the cover below the water surface.

(21) FIG. 8 shows a side view of an altered cover carriage. A separate end flap of the cover, designated 33, on transporting to the drawn pulled-out end position, moves from its normal ready position on the drum through the drawn intermediate position into the final position drawn in full lines. It thus also covers the edge of the basin or pool by covering frontal wall 2. If there is a step ladder, its banisters are surrounds by slots.

(22) To activate the covering operation all that is required is the pushing of a button. Insofar as the carriage is not stopped in an intermediate position by the operation of a special button, it is transported automatically to its appropriate end position, where it is stopped by the fact that one of the electromagnetic limits switches 17 or 18 is activated by the presence of a metallic part. As soon as motor 15 is stopped, the brake provided within it operates without delay. Instead of a braking motor, any other appropriate brake or stop may be used.

(23) In FIG. 8, an endless pulling element 35 is placed under tension in the conventional manner by roller 36. The element 35 is looped around roller 37 on the shaft of motor 15, and free-running coupling 38, 39. The pulling element can be a chain, requiring separate chain wheels, but is also can be a belt, where the housings of the free-running coupling can be used as the belt discs. Free-running coupling 38 is connected with drum 22, free-running coupling 39, along with front wheels 10, is on the coupling shaft 12.

(24) Both free-running couplings rotate steadily in the same direction, but they couple in opposite directions. Thus with clockwise rotation in FIG. 8, coupling 39 is closed in accordance with arrow 40, while coupling 38 is open or free-running according to arrow 40a , drawn in dashed form. In this direction of rotation, the carriage is transported to the right in the pulling-out direction of the cover, with free-running drum 22. Here a small braking torque is applied, in a manner not shown, to the drum, so that the cover does not unroll in an uncontrolled way, causing sagging.

(25) If the direction of rotation is reversed, however, drum 22 is driven by closing coupling 38 according to arrow 41, while coupling 39 is open, according to arrow 41a. Thus the cover, with its end 31 attached at the end of the pool or basin, is positively rolled up, and with uncoupled transport mechanism the carriage is pulled into the end position.

(26) In the exemplary embodiment a single cover is used, consisting generally of one or more synthetic layers connected with each other. A fabric cover that

has been coated on one or both sides with synthetic material can also be used. By means of floating elements that are attached on or in the cover, the cover can be made floatable. Transverse, rigid ribs can also be attached to such a cover, giving it sufficient load-carrying ability and stiffness to support at least children, and to prevent the accummulation of water in the center of the cover. Fundamentally, instead of such a cover, a rigid cover made in the form of a roller-blind can be used, as long as the individual elements of the blind are sealed to each other in an air-tight manner.

(27) The drive motor can be a braking motor, preferably a low-voltage braking motor, which can be controlled by limit switches without having to be touched. The entire electrical installation can be insulated from outside in such a way that even with normal potentials of 220 volts there is no danger. For additional safety, low voltages can be employed, for example 12 or 24 volts. Greater safety is also obtained, for example, by using a non-dangerous fluid such as air or water. Then, all that is necessary is a sealed pump at a fixed location. The connection to the carriage is obtained by means of a hose or similar element that can be rolled up on a drum in the same manner as the electric cable. On the carriage, only simple hydraulic motors are then used, in the case of water, for example, a toothed-wheel motor. With the use of air, at least, an end position control can be achieved without the need for touching. But the end position control can also be achieved by making this control dependent on drum rotation, in that, for example, a spindle limit switch is attached.

(28) According to another embodiment of the present invention, the carriage is provided with a chargeable energy storage element, such as an electric battery or a pressure tank. This element can preferably be self-connecting at an end position to a source of energy. But a tank storing compressed air or a similar substance can be used equally well. The tank can be connected in an end position for a short while to a compressor, a high-pressure line, or a fixed pressure tank by the opening of a valve.

(29) Without further analysis, the foregoing will so fully reveal the gist of the present ivention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalenece of the following claims.

CLAIMS:

We claim:

1. A covering arrangement for open areas comprising, in combination, flexible cover means; winding drum means attached to one end of said flexible cover means, said flexible cover means being windable on said drum means; reversible motor means linked to said drum means for unwinding said cover means from said drum means in one direction of said motor means, siad cover means being wound onto said drum means in the reverse direction of said motor means; wagon means for carrying said drum means and transporting said drum means; drive means on each side of said drum means; and coupling means connected between said motor means, drum means and drive means so that said motor means is connected to said drive means when said motor means rotates in said one direction, said motor means being connected through said coupling to said drum means when said motor means rotates in said reverse direction.

2. The arrangement as defined in claim 1 including directional dependent

holding means on said drum means.

3. The arrangement as defined in claim 1 wherein said coupling means comprises two free-running couplings; and endless drive means connected to said free-running couplings; and housing means for said coupling means and having disc means for driving said couplings.

4. The arrangement as defined in claim 1 wherein said motor means is within said drum means, the housing of said motor means being fixedly connected to said drum means, the driving shaft of said motor means being supported on one of said drive means, said drive means having wheel means, said drum means being connected to said wheel means through said coupling means.

5. The arrangement as defined in claim 4 including slip clutch means on the frame of said drive means for braking said driving shaft of said motor means.

6. The arrangement as defined in claim 4, including brake support means for said wheel means for braking said wheel means at least during the winding of said cover means on said drum means.

7. The arrangement as defined in claim 6, including auxiliary wheel means supported on the edge of said open surface; and endless band drive means on the edge of said open surface and rollable therefrom, said driving band means being slung on said wheel means and said auxiliary wheel means.

8. the arrangement as defined in claim 4, wherein the outer diameter of said wheel means is substantially larger than said drum means with said cover means wound on said drum means; and including compensating means for compensating for the difference of said diameters.

9. The arrangement as defined in claim 8, including slip clutch means connected to said coupling means, said slip clutch means and said coupling means being connected between said drum means and said wheel means.

10. The arrangement as defined in claim 8, wherein said compensating means comprises a rim of substantially soft elastic and deformable material about the periphery of said wheel means.

11. The arrangment as defined in claim 10 wherein said rim has uniformly distributed radial and outwardly directed projections.

12. the arrangement as defined in claim 4, including brake means arranged closely to said coupling means; spring means for pressing said brake means and coupling means against each other, said wheel means being centrally located with respect to said drum means.

13. The arrangement as defined in claim 12, wherein said brake means and said coupling means have disc-shaped elements, two disc-shaped elements of said coupling means having elastic projections directed against each other on their periphery.

14. The arrangement as defined in claim 4, including power supply cable means wound on said drum means; the variation in exterior diameter from winding said cable means on said drum means corresponding substantially to the variation in exterior diameter due to winding of said cover means on said drum means.

15. The arrangement as defined in claim 14, including a conically shaped winding surface on the side of said drum means for winding on said conically shaped surface said cable means, said cable means being screw-shaped.

16. The arrangement as defined in claim 14, wherein said cable means comprises a substantially thin band wound spirally on the side of said cover means.

17. The arrangement as defined in claim 4, including a bearing member for said drum means and connectable torque transmittingly with the driving shaft of said motor means as well as a portion of the frame of said drive means.

18. The arrangement as defined in claim 4, including connecting means at each end of said drum means for selectively connecting to said motor means and said drive means.

19. The arrangement as defined in claim 1, including limit switch means for contactless control of said motor means, said motor means being a low voltage braking motor.

20. The arrangement as defined in claim 1, including energy storage means on said wagon means.

21. The arrangement as defined in claim 20, including energy supply means connectable to said energy storage means in one end position of said wagon means.